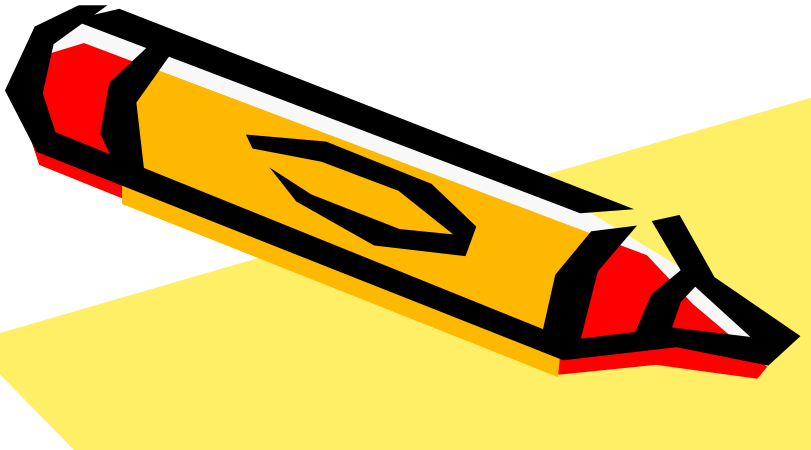

Mutation Nomenclature

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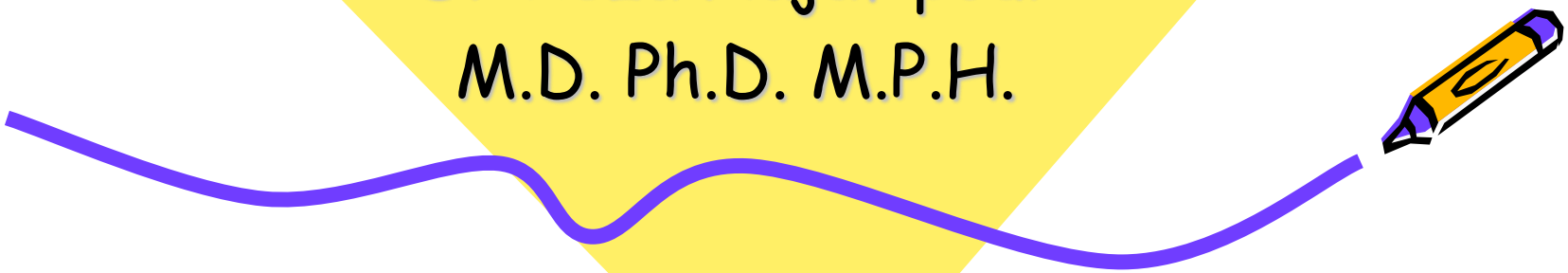
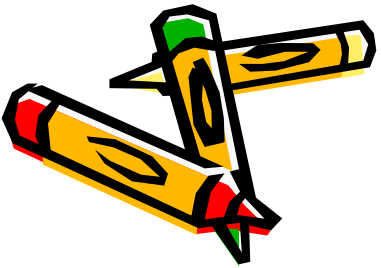


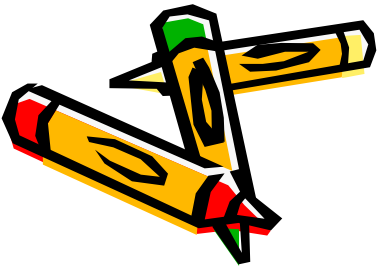
- A nucleotide change is denoted first by the nucleotide number of that base, the original nucleotide, a greater than symbol (>) and the new nucleotide at that position. In genomic DNA, the nucleotide symbols are capitalized; in mRNA, they are lowercase.
- If the full genomic sequence is not known, the nucleotides in an intron (referred to by the expression "intervening sequence," or IVS) are counted as +1, +2, and so on, in which +1 is the invariant G of the GT in the 5' splice donor site, or as -1, -2, and so on, counting back from the highly invariant G of the AG 3' splice acceptor site. Small deletions are indicated by the numbers of the nucleotides deleted, separated by underscore (____), followed by the term *del*, and then the actual nucleotides that have been deleted.

- Small insertions are designated by *ins* after the two nucleotides between which the insertion occurred, followed by the actual nucleotides inserted.
- A missense or nonsense mutation can be described at the level of the protein by giving the correct amino acid, the position of that residue, and the amino acid that replaced the normal one.
- In cDNA, the A of the translational start ATG is designated +1. The next base upstream is -1; there is no 0. The amino-terminal methionine is numbered +1 in the protein



Examples

- c.1444g>a: a mutation at position 1444 in the hexosaminidase A cDNA causing Tay-Sachs disease
- g.IVS33+2T>A: a mutation substituting an A for T in a splice donor site GT of intron 33 of a gene
- g.IVS33-2A>T: a mutation substituting a T for an A in the highly conserved AG splice acceptor site in the same intron
- c.1524_1527delCGTA: a deletion of four nucleotides, numbers 1524 through 1527 in cDNA



- c.1277_1278insTATC: a four-base insertion between nucleotides 1277 and 1278 in the hexosaminidase A cDNA, a common mutation causing Tay-Sachs disease
- Glu6Val: a missense mutation, glutamic acid to valine at residue 6 in β-globin, that causes sickle cell disease
- Gln39X: a nonsense mutation, glutamine to stop codon (X) at position 39 in β-globin, that causes β0-thalassemi.